Architectural CONCRETE

Sioux City's Monument to Music

By HENRY L. KAMPHOEFNER

SIOUX CITY'S new concrete music pavilion is the outcome of a series of interesting incidents which started with the competition for the 1933 Paris Prize. The subject, it will be remembered, was a monumental band stand, suitable for erection in a natural amphitheater. The design submitted by the writer in that competition was exhibited, later that year, at a District Rotary Convention under the sponsorship of the Sioux City Society of Fine Arts.* Music patrons and civic groups in the town were greatly interested.

It had been a long cherished hope of Sioux City, which supports the Monahan Post Band, a symphony orchestra, an a capella choir and various little-theater groups, to have a permanent outdoor pavilion in Grandview Park to replace an old wooden band stand. The competition plans supplied the inspiration for a campaign which soon saw 19 civic organizations actively engaged in promoting the immediate construction of a new pavilion. Their efforts were so effective that, during the first week of March, 1934, local, state and Federal authorities had approved the plans as a CWA project and work was started. When CWA lapsed, the project was transferred to FERA. The last concrete was placed on October 17. The pavilion is now ready for dedication.

Tragic Muse—precast in plaster mold.

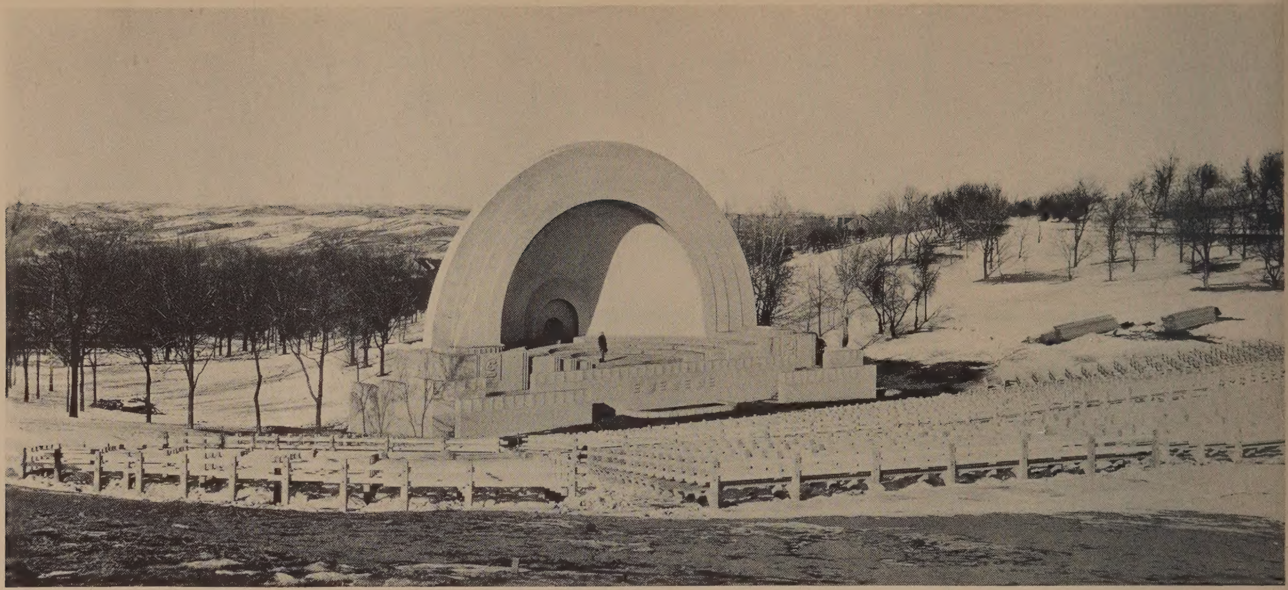
I have been asked frequently: "What is the architectural style of your building?" That is difficult to answer concisely; but I have preferred to feel that it is a thing of philosophic meaning; a breaking away from stifling traditional influences as well as being a style that is modern. Modern, I mean, as we and our civilization and the material with which we build are modern.

My problem was, fundamentally, to amplify the music of the orchestra and place it in an architectural setting of beauty. No finer setting could have been provided than the natural amphitheater in lovely Grandview Park.

I definitely decided three things while preparing the first studies of the structure. First, that I would not try to conceal the function of the building behind false forms; that whatever shape was required to reflect the sound to spectators properly, I would feel free to express it frankly. The truncated cone with the angle set in correct relation to the slope of the amphitheater was, I found, the most ideal shape—and I built my forms about that shape.

The second decision was that I would be honest about my selection of concrete as the construction material. I would express it as concrete and nothing else. No imitation stone joints would be made and no paint added to cover up the texture. The concrete must stand for what it is. The third decision was that no ornament should be added that was not purely organic and integrated to the mass. The fluted walls were not to be a terminating motif, but to give rhythm to the base. The four teeth-like projections between the fountain heads were but to strengthen the horizontal. The drums at the sides of the orchestra stage—on whose face is the sculpture—were to give base to the arch and hold in the thrust. Since the arch itself is a monumental *tour de force*, I realized I could achieve airiness in it without losing massiveness by dropping the center of the outside circle four feet below the inside circle, thus lightening the top.

*Editor's Note—Mr. Kamphoefner's design won Honorable Mention in the first preliminary trials of the 1933 Paris Prize competition.



The pavilion's setting is a natural amphitheater in Grandview Park. It is not difficult to imagine the charm of this scene on spring and summer evenings when Sioux City crowds gather for concerts or "little theater" dramas.

Herschel Elarth, the sculptor who designed the figures of the Tragic Muse and the Faun, wrote to me after completion of the work: "I begin to believe that you have caught that ineffable flow of dynamic sound—a majestic strain of Beethoven's sixth, fitting the great-arch dome—an andante undertone pulsating staccato-like through the fluted base-walls." I believe no finer compliment could have been given my effort. To have created music in these concrete forms was what I had dreamed of doing.

The great-arch is concrete cast with three hollow spaces running through the arch. At the crown the arch is 11 ft. 8 in. thick, at the base 15 ft. 8 in. The thickness of the reinforced concrete section is the same from base to top, the variation in arch depth being taken up by the cellular sections which taper from base to crown. The arch needed depth to give it proper mass, but about 60 per cent of the weight was eliminated by the hollow construction.

Up to the great-arch there was nothing very unusual about the form work. Shiplap was used for the form sheathing, with 2 x 4 studs and 2 x 6 walers. On the circles of the orchestra stage, plywood was used for forms, securely nailed to segments made of 2 x 12 planks cut to correct radius.

The inside form of the cone and the outside form of the arch were completely built before the outer cone-form and the form for the back of the arch were constructed. Two ribs were cut from 2 x 12 planks to the curvature of the intrados of the arch. Similar ribs spaced five feet apart were cut for the cone centering. Two by six rafters were then placed on the ribs to support the sheathing. The forms were thoroughly braced and counter braced until the underside was a maze of lumber. The shoring was carried down to the stage floor which was adequately shored on the underside to support the weight of the unhardened concrete.

After the inside form for the cone was completed and reinforcement placed, the outside forms were built. Eight-in. metal spreaders held them in position and maintained a uniform thickness at all points in the cone. Six feet of concrete was placed at a time, with the outside form built up just before each placement. The inside forms for the hollow spaces of the arch were held in place with spreaders and wedges. When the concrete had hardened sufficiently after each placement, the wedges were knocked out and the inside forms removed. Metal lath was used at the crown in place of the inside wood form so that no wood was left in the arch.

When the forms were stripped the entire outside surface of the concrete was roughened with small pneumatic hammers and then washed clean to receive a stucco finish. Shortly before the stucco was applied, the concrete was again thoroughly dampened to secure a uniform suction and to prevent absorption of the mixing water from the portland cement stucco. The stucco was applied in two coats. The first was ½ in. thick and consisted of one part gray portland cement to three parts clean screened sand with a small amount of Celite. The final coat was made of one part white portland cement to two parts Platte River sand. The work is of high quality and gives promise of great durability.

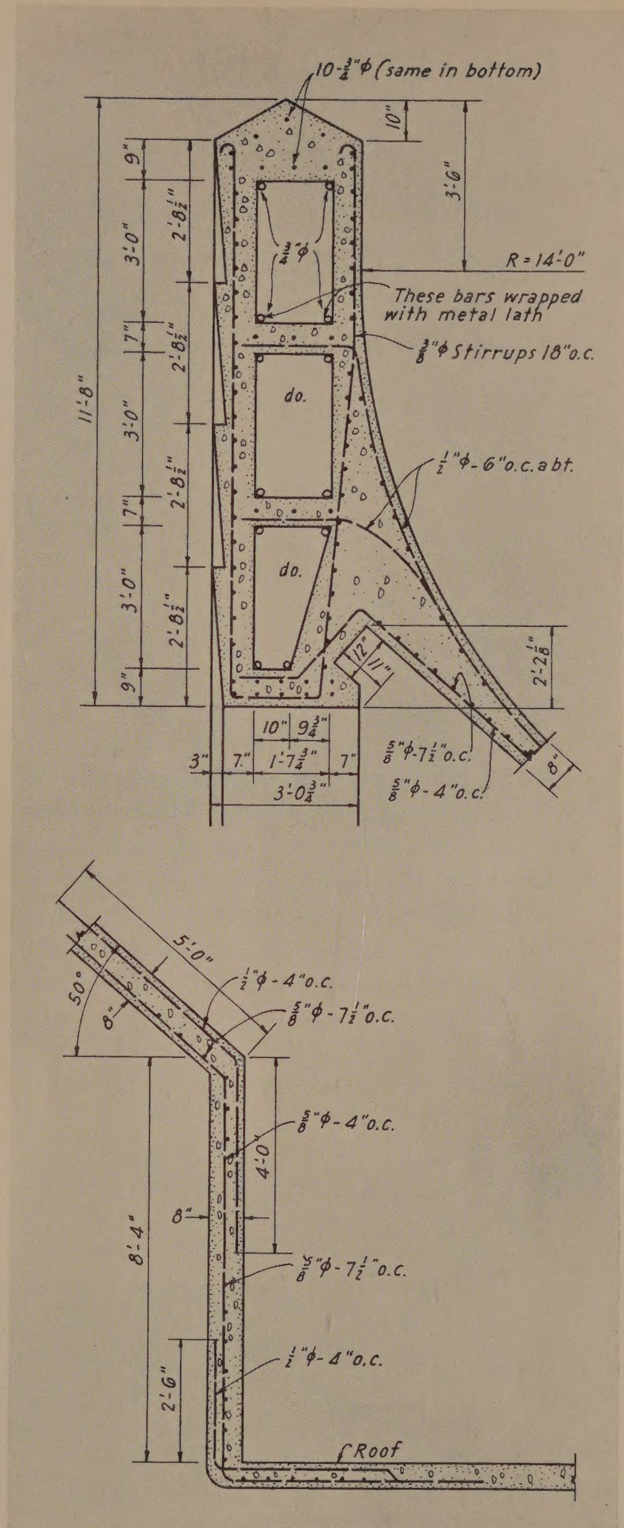
The figures of the Faun at the right, and the Tragic Muse at left stage were first modeled in clay, in the studio of the Public Works of Art at Iowa City. Negative molds were cast in plaster of paris. From these molds the white cement con-

crete plaques were precast and set in recesses in the monolithic concrete.

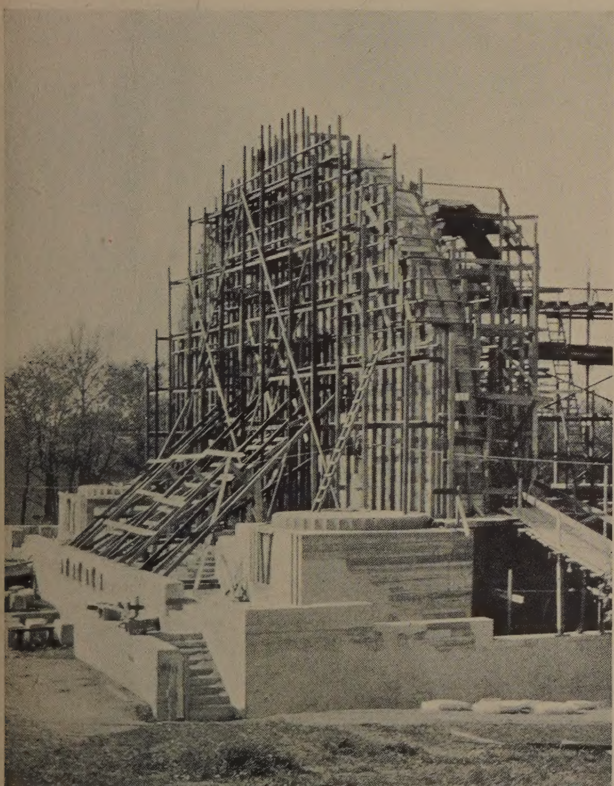
There was much speculation relative to the sound reflecting qualities of concrete before the building was finished, and many wondered whether the acoustics would be satisfactory. The first Sunday after all forms were stripped, the band played a few selections and found the acoustics so nearly perfect that a voice even in the lowest tone could be heard behind the last row of seats. In fact, it was found that members of the band had to be very careful of what was said anywhere on the stage because everything could be heard easily over the entire amphitheater.

The Sioux City music pavilion—like the specifications required by the Paris Prize competition—accommodates 300 vocalists or 100 seated musicians. Its stage is approached from the back and by two stairways on each side, making it suitable for elaborate outdoor pageants. The cove formed by the junction of the great-arch and cone conceals 87 lights. These are intensified by a broad beam reflector with a color lens and are controlled by automatic inductor dimmers. There are 6,000 seats in the amphitheater which is now nearly completed. The benches have concrete supports for wood seats and backs. There will be room within the amphitheater for 4,000 additional spectators.

Structural design for the pavilion was made by Paul Cook and Bruce Packard of the City Engineer's office. The cost of the building was approximately $51,000.



Section through crown of great-arch and cone. The angle of the cone is important to the acoustics of the shell.



Forms ready for placing concrete in the arch. The inside forms for hollow spaces were held by spreaders and wedges.

Krape Park Bridge

A Rigid Frame in Architectural Concrete

By MOGENS IPSEN

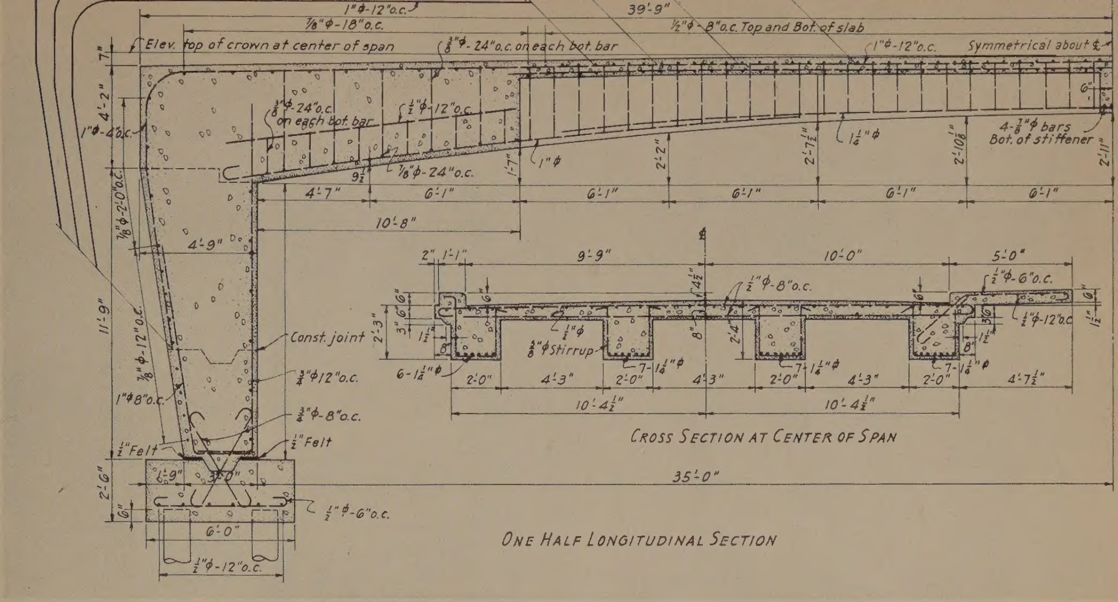
BRIDGES, being devices for carrying loads safely over streams, gorges and railway cuts, have always been given careful consideration in so far as structural requirements are concerned. Not always, however, have their architectural features been so carefully studied. Yet, despite this subordination of esthetics to structural design, many of the older bridges—particularly of the arch type—are beautiful and graceful examples of the bridge builder's art.

Today engineers are giving more and more thought to architectural problems involved in their bridges; and their preliminary plans anticipate esthetic as well as structural perfection. It is not considered improper or an admission of incompetence to enlist architectural assistance on a bridge project. As a consequence, bridges are becoming increasingly more attractive, more in harmony with the urban or rural scenery in which they are built.

A long step in this direction has been the development of the rigid frame concrete bridge, not only a "natural" for architectural treatment, but a new approach to economical structural design. Adaptable to relatively large as well as small spans, the rigid frame type is especially suited to many bridges and grade separations which will loom large in highway improvement programs during the next several years. An example of an architecturally treated, small rigid frame concrete bridge was completed last fall in Krape Park, Freeport, Illinois.

An old truss bridge on the site collapsed in 1933 because it did not have strength to carry the loads imposed upon it. Since it was located on an important thoroughfare, plans for a new structure were started almost immediately and the

Strong but light and graceful design and treatment of detail of Krape Park Bridge, Freeport, Ill., set a new high standard in bridge building. Mogens Ipsen, engineer. R. K. Eastman, architectural assistant.



By designing Krape Park Bridge as a rigid frame, the crown depth of 2 ft. 4 in. for the 70-ft. clear span is sufficient for H-15 loading. These details show arrangement of ribbed section which reduces dead load stresses.

rigid frame type was selected because it was believed best suited to the conditions of the site and the scenery of the park. As the bridge now stands, that choice is entirely justified. Gracefully curved lines, well balanced proportions and general appearance of strength and sturdiness despite the surprising lightness of the deck, all combine to make this bridge a structure of beauty.

Good foundation conditions made it possible to analyze and build the bridge as a two-hinged arch or rigid frame. A rock ledge under one end wall provided proper foundation for one footing. The other footing was supported by 22 piles driven vertically into the gravel bottom. A slight difference in end wall heights was considered insignificant and was disregarded.

The live load was the usual H-15 loading, and design specifications followed the practice of the State Highway Department of Illinois. The analysis included, in addition to dead and live load, volume changes of the deck and some allowance for horizontal displacement at the footings. Maximum stresses which were considered conservative, were kept within 1,000 p. s. i. in the concrete and 18,000 p. s. i. in the reinforcement.

The bridge has a roadway width of 19 ft. 9 in., and there is a 5-ft. sidewalk carried on a cantilevered slab. Clear span is 70 ft. between end walls. Maximum depths are 2 ft. 4 in. at the crown and 4 ft. 9 in. at the springing—or 1/30 and 1/15 of the clear span respectively. A larger area for water passage was thus provided than with any other deck type structure, and the deck appears unusually graceful and well proportioned. The end walls and outer portions of the deck are of solid rectangular sections, but the center of the deck is ribbed, the ribs being tapered from a width of 2 ft. to 4 ft. 3 in. in a distance of 12 ft. 2 in.

This ribbed section was used, mainly, to reduce dead load and the stresses it produces. The effect of dead loads near the crown is great; but there is little or no effect from dead loads located in or near the abutments.

Construction joints were used in the deck at the ends of the ribbed section and also horizontally below the deck at the corner. In the end wall, a construction joint was made slightly above the average water level. Concreting was stopped at this point while the cofferdam was removed. The construction joint at the top of the footing was made to allow some hinge action. It involved key-and-groove construction to transmit horizontal shear and was reinforced with inclined bars crossing at the joint plane. Outside the groove, ½ in. felt separated footing from wall to prevent bearing between them.

The graceful line of the deck is due to a longitudinal camber with a mid-ordinate of 7 in. in a length of 79 ft. 6 in. The arrangement of the curb produces a shadowline which distinctly divides the side elevation into two parts—the roadway curb and the frame deck. This simple structural feature thereby becomes an important part of the ornamentation.

It is apparent that the structural design furnished the architectural motif for this bridge without subordination of either. Advantage was taken of the structural requirements to introduce architectural detail. The vertical paneling of the retaining walls gives an effect of massiveness to the abutments. The fins terminate the handrails and prevent a too sharp contrast between the vertical lamp posts and horizontal deck. The detail of the side elevation suggests less an ornamental motif than an emphasis of the structural design—the strong union of deck and end wall; the sweeping curve of the deck.

The Krape Park bridge was built for the Freeport Park District of which Charles Demeter is president.

The unusual surface on modernized Trinity Building, Los Angeles, is stucco on new monolithic concrete, textured and marked to resemble a terra cotta building nearby. G. R. Morrison, building engineer; Paul Jeffers, consultant; K. I. Bradley, contractor; Ed Westberg, stucco work—for the modernization.

ALTHOUGH major emphasis has been placed upon the small home in the current modernizing campaign, it is evident to many that real opportunities for the designer and builder will be found in the rehabilitation of commercial and industrial structures.

Two modernizing jobs recently completed, which are representative of what may be accomplished in remodeling of commercial buildings, are discussed here.

Trinity Building before street elevations were modernized.

Two Adventur

TRINITY BUILDING—Los Angeles

The Trinity Building of Southern California Telephone & Telegraph Co. was originally a four-story masonry wall bearing structure with concrete floors and structural steel interior frame. There were no exterior wall columns.

In modernizing, the structural frame was completed by introducing steel columns in the walls. The masonry was removed from the street elevations and replaced with monolithic concrete placed in rough lumber forms.

The unusual finish was made to duplicate the terra cotta exterior of the tall Telephone Company building nearby. This was done by applying ¾ in. of portland cement stucco to the concrete and marking it off into blocks the same size as the terra cotta. The texture was made with pointing trowels and marking tools. After the stucco hardened, it was moistened and sprayed with a special cement paint which, on drying, assumes a gloss similar to terra cotta.

Typical old style loft structure yields to the modern touch. Rebman Building, Philadelphia, after new concrete frame and floors were built. Clarence E. Wunder, architect; L. H. Doane, engineer; Sauter & Schwertner, contractors—for the modernization.

n Modernizing

REBMAN BUILDING—Philadelphia

The transformation of the Rebman Building with its brick bearing walls and wood interior into a modern firesafe structure, reveals interesting possibilities for the rejuvenation of thousands of old industrial plants now nearing the end of their useful years. All work was done inside the old building during winter months.

Without disturbing the old brick walls, they were relieved of all floor loads by building a reinforced concrete skeleton frame. Columns were set back about 8 ft. from the wall and cantilevered beams extended from the columns to the walls to support the floor slab. The walls were anchored to the new concrete floors for stability. By offsetting the columns 8 ft., it was found unnecessary to underpin the existing brick walls.

It was found that the building had been erected over an old creek bed, so the original spread footings could not be used for the new columns. Hence, caissons were carried down to hardpan. The modernization included building of fireproof concrete vaults in the office space and erection of a railroad shipping platform inside the building.

Total contract price for the job was approximately \$55,500, or 9.7 cents per cu. ft. of building space. Shortly after renovation, the Rebman Building was occupied by the U. S. Metallic Packing Co.

Wood interior of Rebman Building before modernization.

Architectural CONCRETE

ARCHITECT · ENGINEER · CONTRACTOR

Notes and Asides

This time, ARCHITECTURAL CONCRETE takes a look at several of the relatively small projects which now form the bulk of private construction activity and will probably continue to do so until the return of universal opulence. The structures discussed and illustrated in these pages are interesting as solutions for particular design and construction problems, but also because they reflect the high art and keen craftsmanship which are being applied to less pretentious buildings these days.

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The exception, as far as size is concerned, is the huge Grand Central Palace of the Brussels Exposition. Its size, bold treatment of the modern style, and unusual structural design will probably make it one of the outstanding architectural and engineering feats of the year. This seems to be an age of national and international expositions: Chicago in 1933 and 1934; San Diego and Brussels in 1935; San Francisco in 1936 and Paris in 1937. All are important expositions of contemporary architecture. But in 25 years the Chicago fair will be but a memory except as its temporary structures are perpetuated through their influence on the architecture of the next generation. While Brussels and Paris, where the chief buildings are permanent structures, will have something to show for the efforts of their best designers of today. Why must so many fine examples of American architecture be lost and destroyed just because they were part of an exposition?

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The word *modernizing* has been used so much lately that, like anything else repeated too often, too fast and carelessly, it is beginning to lose interest and significance. It does not mean patching, repairing or temporary improvement. It means bringing-up-to-the-minute in style, quality and value. Instead of looking at a modernizing project as a poor substitute for the real thing, we should all approach it as an opportunity to create something new, beautiful and useful in or over the durable relict of something that has lost its value to age, wear and change.

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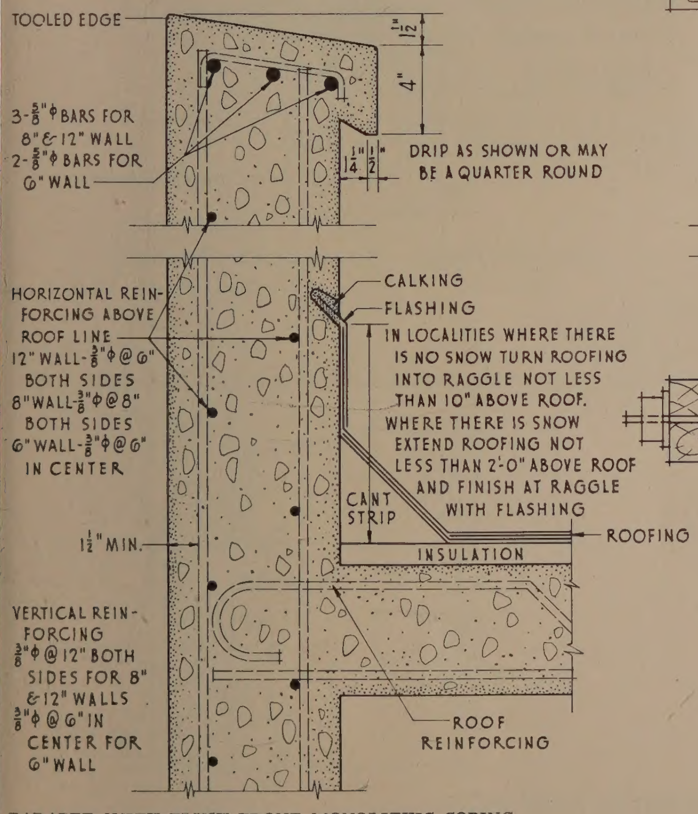
COPINGS AND PARAPETS

It is essential that copings and parapets be properly constructed, regardless of the kind of building material used, because of the exposure to which they are subjected and the serious consequences of failure. Imperviousness of the construction material is important, but for the most part unsatisfactory performance is due to improper details rather than to permeability of the material itself. Concrete of the quality generally specified for the lower part of the walls in monolithic concrete buildings is suitable for the parapets and copings.

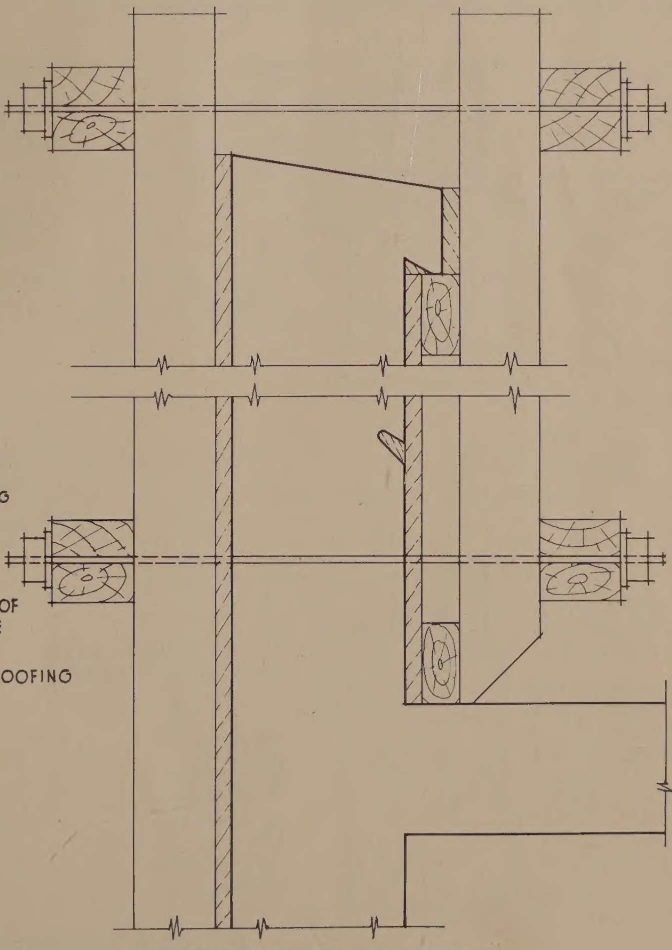
Water is a destructive agent and should not be allowed to stand on the top of a wall. Cast-in-place copings should be given a slope of about $\frac{3}{16}$ in. per inch to insure quick and complete drainage. A steeper slope is difficult to finish properly by troweling and requires a top form which is objectionable where it can be avoided. The slope on a precast coping may be about twice as steep as that on copings cast monolithically since the former is cast with the top surface down.

A projecting drip on a coping as shown in the details affords additional protection for the parapet by directing the run-off away from the wall surface. The projecting drip

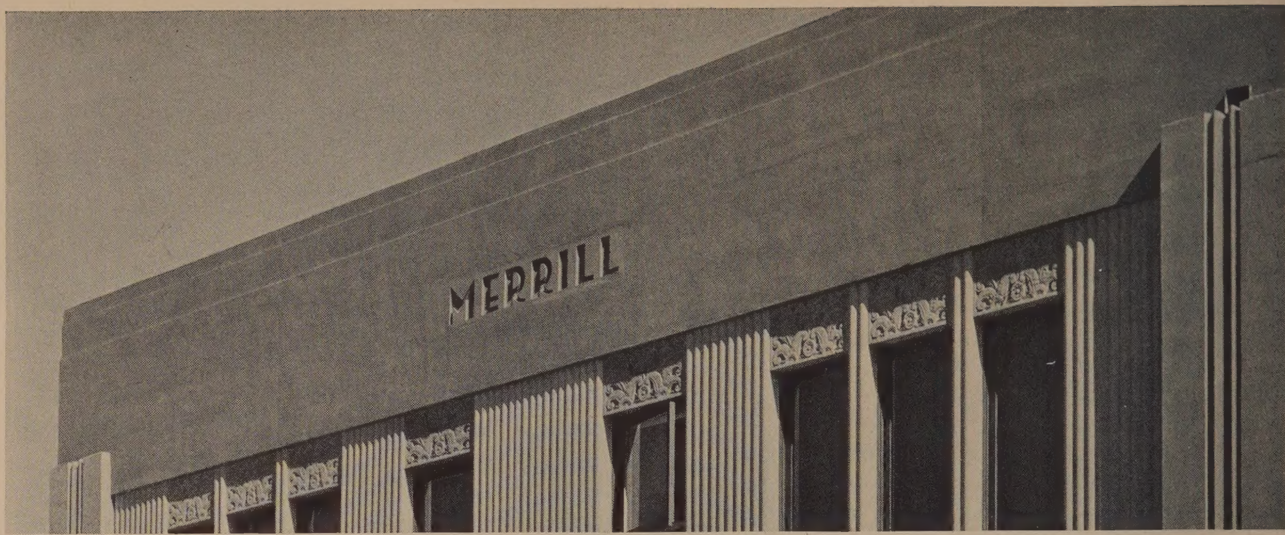
EDMOND MEANY HOTEL, SEATTLE, WASH. R. C. REAMER, ARCHITECT. TEUFEL AND CARLSON, CONTRACTORS.



PARAPET WITH FLUSH FRONT MONOLITHIC COPING.



FORMS FOR PARAPET AND COPING.

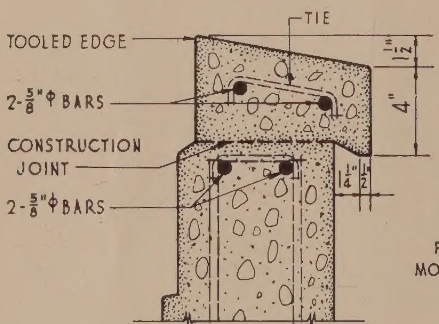


MERRILL BUILDING, LONG BEACH, CALIF. SCHILLING AND SCHILLING, ARCHITECTS.

also prevents water from working into the mortar joint in case of precast copings. If the coping is monolithic with the parapet, the drip is not absolutely essential and a slight saving in construction cost can be made by omitting it.

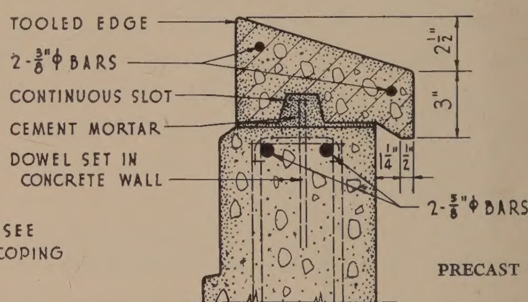
If the coping is cast in place after the concrete in the parapet has hardened, a strong, tight construction joint should be made. Any laitance should be removed from the top of the wall and the surface should be roughened and slushed with neat cement grout before the coping concrete is placed. For buildings in regions subject to earthquakes, the vertical reinforcement should extend into the coping or dowels should be provided.

A full mortar bed of 1:3 portland cement mortar should



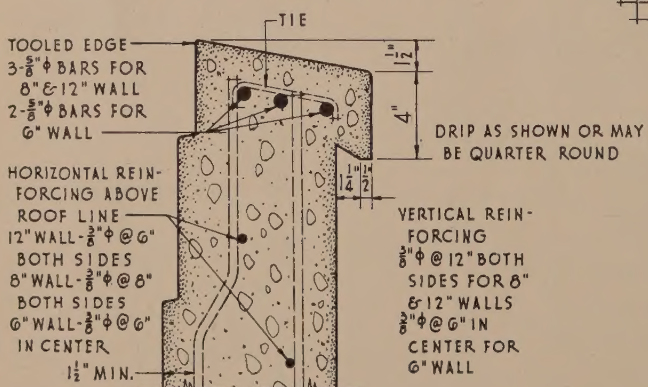
CAST IN PLACE COPING.

FOR GENERAL NOTES SEE MONOLITHIC CONCRETE COPING

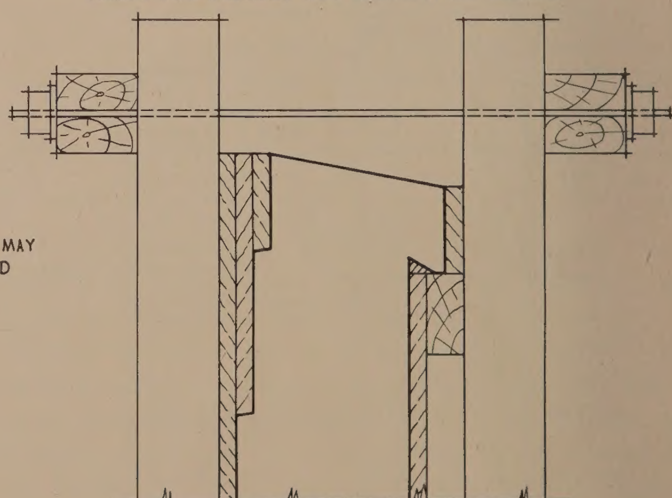


PRECAST COPING.

MONOLITHIC CONCRETE COPING.



FORMS FOR PARAPET AND MONOLITHIC COPING.

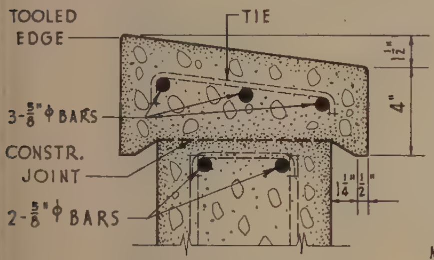


DOUBLE SET BACK PARAPETS.

IDAHO POWER COMPANY, BOISE, IDAHO. WAYLAND AND FERRNELL, ARCHITECTS.

be used for bedding precast copings. In earthquake regions threaded dowels should extend entirely through the coping which should be secured by a nut in a recess in the top of the coping. The recess should be filled with mastic to exclude water. The vertical joints between sections of coping should be pointed with an elastic compound to a depth of about ¾ in. Fill balance of joint with mortar.

As in other construction a raggle should be provided in a monolithic concrete parapet to receive the roof flashing. A patented type of raggle strip may be used, or a wood form as shown is satisfactory. If the wood form is used, it should be very lightly tacked to the sheathing so it will come loose easily when forms are stripped.



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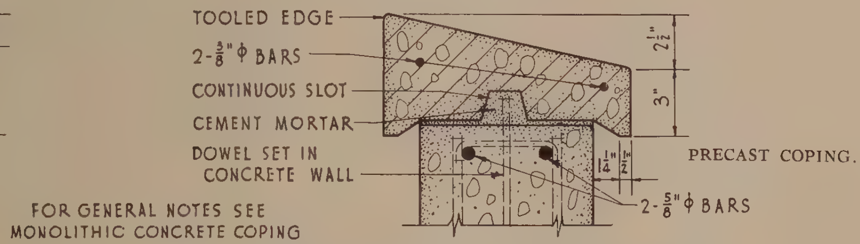

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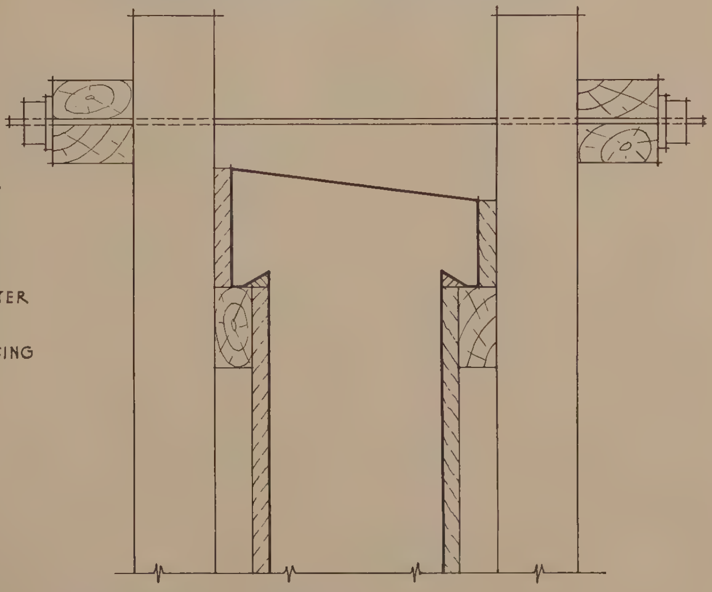

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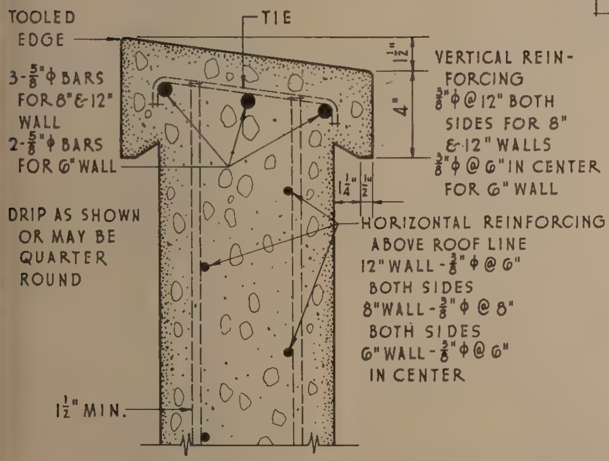
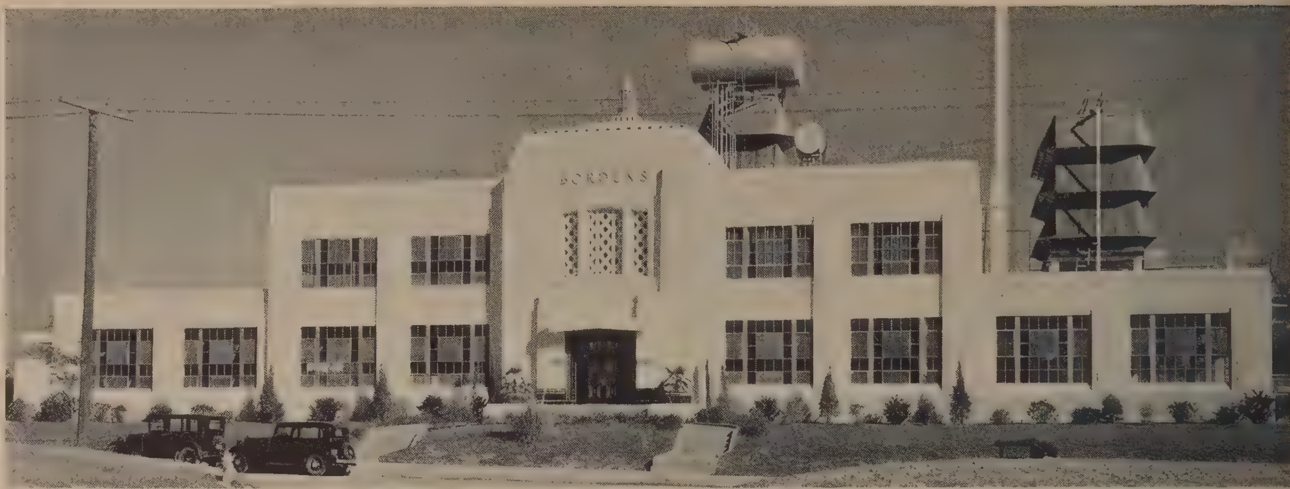


PARAPETS WITH PROJECTING COPINGS.

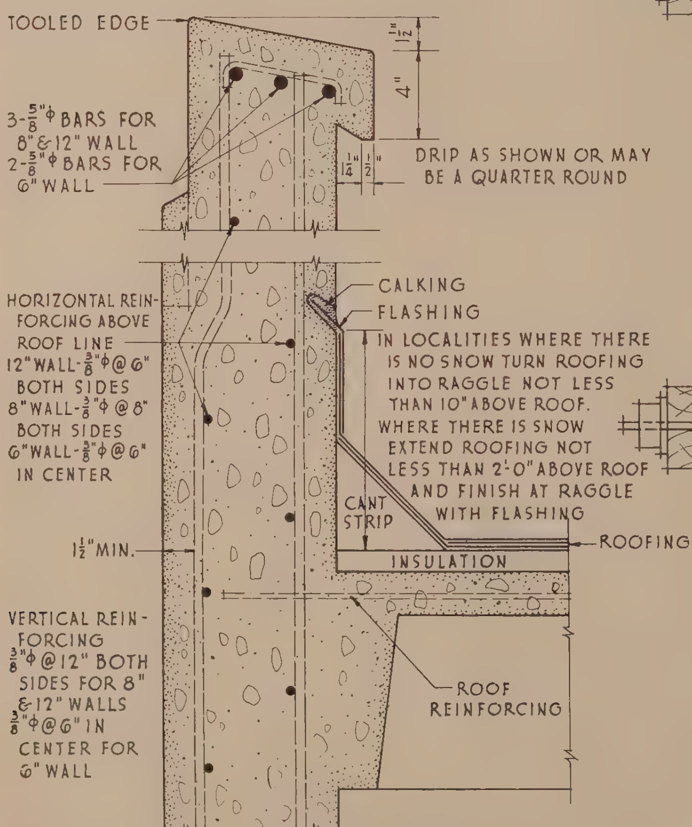


BORDEN MILK COMPANY, SAN ANTONIO, TEXAS. AYRES AND AYRES, ARCHITECTS. K. B. KEY, CONTRACTOR.

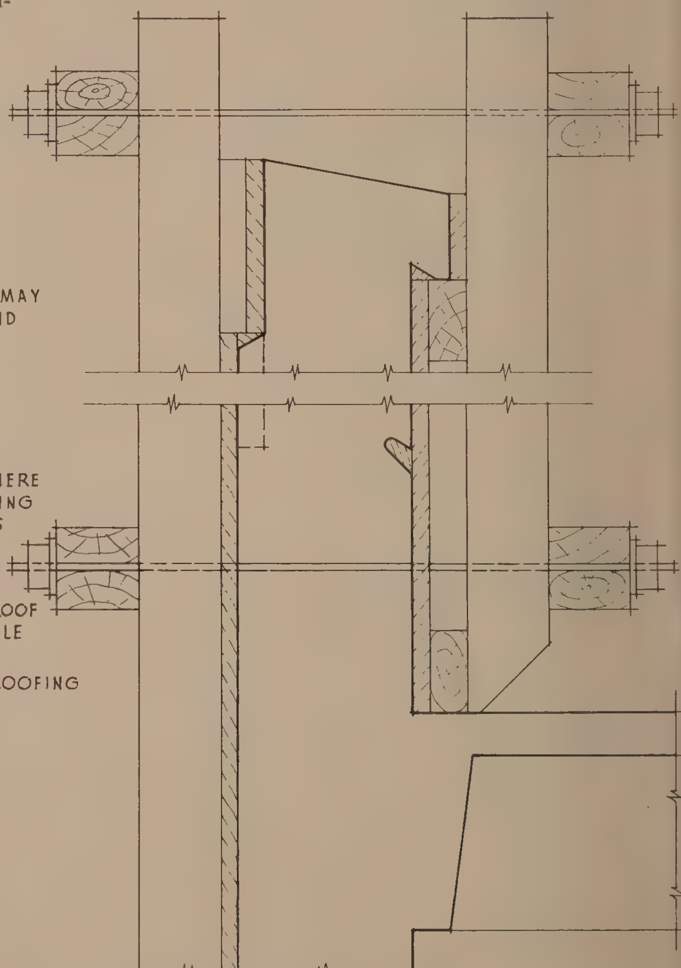
It is desirable, though not essential, to coat the entire inside surface of parapets with roofer's pitch. This is especially desirable in regions of much snow fall where the snow may drift against the parapet even above the flashing.

There is a concentration of stress in parapets which requires that more reinforcement be provided above the roof line than in the wall below. This is particularly true at the coping. The details show the recommended minimum reinforcement for parapets of various thicknesses.

The buildings in the illustrations show how parapets and copings such as those detailed appear when constructed. The details, however, are not of the specific buildings shown.



PARAPET WITH SINGLE SET BACK MONOLITHIC COPING.



FORMS FOR PARAPET AND COPING.

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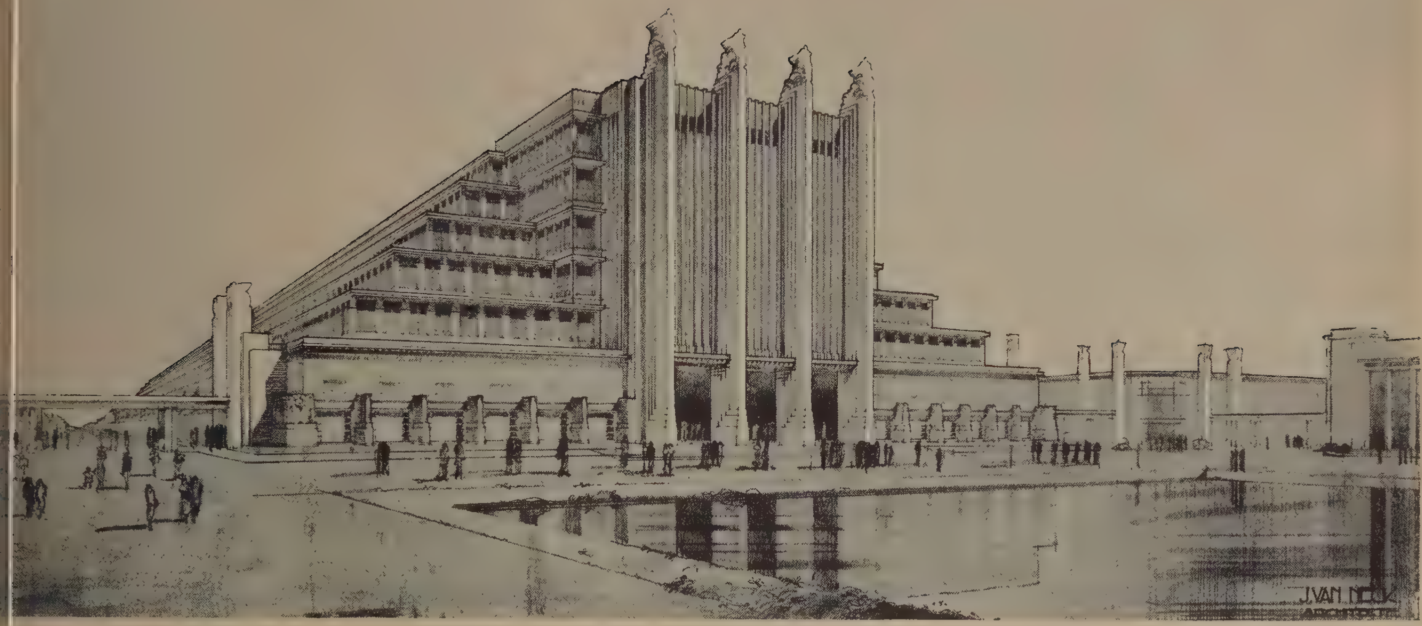


Architect J. Van Neck's impression of completed Grand Central Palace for Brussels Exposition. Louis Baes, consulting engineer. "Engema," contractors and builders.

Brussels' Grand Palace

Something New in Exposition Architecture

VISITORS to the Brussels Universal and International Exposition this summer will behold many strange and beautiful things, not the least of which will be the six distinctly modern structures which have been built to house the exhibits and activities of the fair. And, towering among these, both in size and interest, they will see an exciting, massive building—the Grand Central Palace, heart of the Exposition.

From the outside the structure has the effect of two giant staircases ascending, from opposite sides, to a great platform. Against this platform, and covering the sides of the "stairways" is a cast stone facade whose central motif is a group of four tall, slender pylons. This boldly impressionistic structure, however, is but an envelope, a cover for a clear area of 3¾ acres, not one square foot of which is broken by interior supports.

Inside, one sees a tremendous hall—528 feet long—whose concrete slab roof-terraces and glass window-walls are supported on 12 great arches spaced about 40 ft. apart. These arches have a span of 282 ft. and a rise of almost 100 ft. At the crown of each arch is a cylindrical metal hinge, and at the footings are spherical metal hinges.

The reinforced concrete arches are tied in pairs by beams cast in place with the arches. Cantilevered beams extend on both sides of these paired arches for a distance of about 20 ft., thus making expansion joints every 80 ft. This arrangement makes each group of arches completely independent of the adjoining groups. The framework is then, in effect, a series of six bridges, each composed of two arches coupled together. Both facades enclosing the ends of the structure are self-supporting and totally independent of the arches.

The arch ribs are uniformly 39 in. thick over their entire length. The depth of the ribs is about 5 ft. at the springing, increasing to 6 ft. at the haunch and converging at the crown to 3¼ ft. Oblique reaction on the footing hinge is about 850 tons, and the thrust upon the crown hinge is 300 tons.

The arches rest on massive foundations of concrete which distribute the load of each arch to 29 piles, 25 of which are inclined 25 degrees and four are upright. Since settlement

Interior view of Grand Central Palace. Photo taken after concrete arches, roof terraces and concrete window mullions had been completed.

of foundations might cause considerable stress in the coupled arches, a particularly sturdy pile system was necessary.

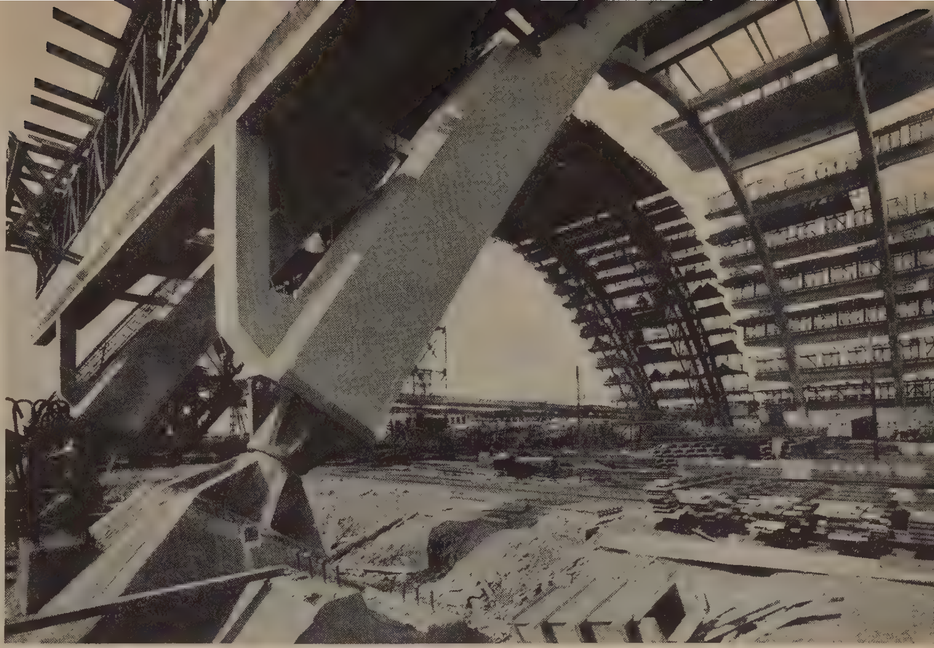
The coupled arches were erected by means of movable steel centering arches having the shape and dimensions of the lower curve of the concrete arches. Forms for the arches and tiebeams were hardened steel secured to the centering. The total weight of the centering and the forms, about 600 tons, was carried on a projection of the arch footing.

Reinforcement for each arch comprised about 60 tons of steel, fabricated in 1-ton sections on the ground and hoisted into the forms by a crane.

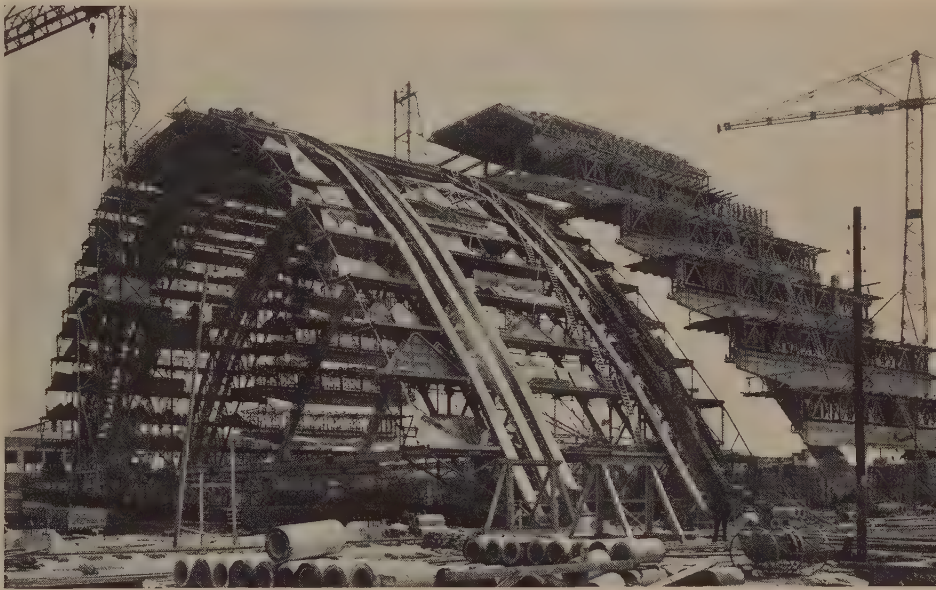
Concrete was placed with two concrete pumps capable of forcing a very stiff mixture over a horizontal distance of 650 ft. and to a height of 140 ft. The pipes through which the concrete was pumped had an inside diameter of 6 in. The capacity of the machines was 16½ cu. yd. per hour. This relatively new method of concreting permitted the use of a very stiff, low water-ratio mixture indispensable for obtaining the durable, dense concrete desired. Placement was started at the footing hinges and carried up each side to the crown hinge. The concrete was vibrated in the forms by recently developed mechanical vibrators.

After the concrete in the arches had hardened sufficiently so the forms might be stripped and the centering removed, the concrete arches were literally lifted off the centering with screw jacks. Two 300-ton jacks were placed between the two halves of each pair of arch ribs at the crown hinges. By extending the jacks, the length of the ribs was increased sufficiently to relieve the centering of the weight of the arches. The centering was then lowered to rollers and pushed 80 ft. into position for the next set of arches. This operation was repeated for each set of coupled arches. Work of building the cast-in-place roof slabs and erecting window frames was started as soon as each pair of arches was completed and the concrete cured thoroughly.

The facades were built of large cast stone units supported by a reinforced concrete frame. This frame also provided support for abutting roof terraces which connect with that part of the structure supported by the arches, giving a pyramid effect on each side of the main entrance pylons.

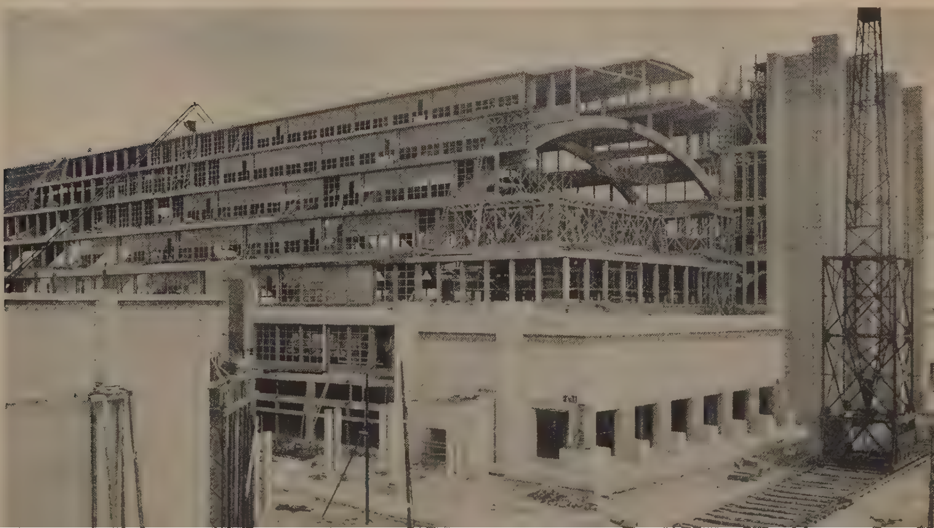


First pair of three hinged reinforced concrete arches completed and centering moved to position for second group.

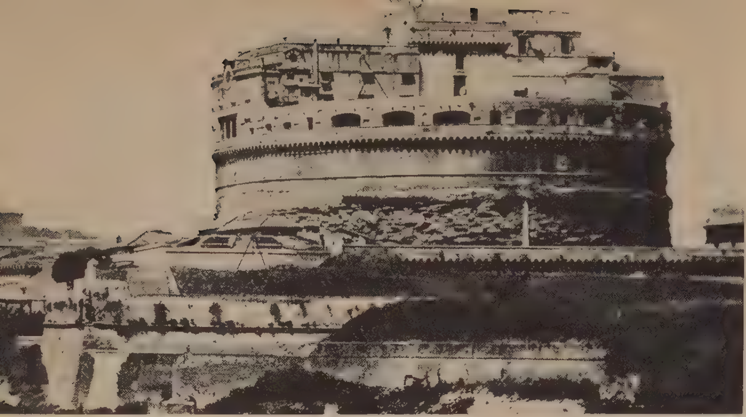


The steel centering—at left—is ready for reinforcement. At right—the terraces are being constructed over the finished arches.

Editor's Note—This article is composed of excerpts translated from various papers in *La Cite* and *Bulletin, Société Belge des Ingénieurs et des Industriels*, by Louis Baes, consulting engineer for the Brussels Exposition.



Finishing the palace. Erecting cast stone facades and glazing the window-walls. The facades are supported by a structural frame independent of the arch frame.



Castle Sant' Angelo, Rome—138 A. D.

A Gallery

Answering the Questi

HERE are eight exposed concrete structures covered with years, history, adventure and ivy—eight oldsters which have taken the gaff of wind, weather and time. The grey-beard of the pack saw the glories of ancient Rome; the youngest was born with the present century. If their architecture doesn't dazzle, remember their eras and compare them with their contemporaries. The important thing is that all of them are in good condition and all *are being used today*.

They represent a variety of cementitious materials and a greater variety of construction techniques—none of which are lost arts, all of which have been improved manyfold. Their endurance suggests what might be expected of modern concrete and 1935 building art.

138 A. D. One of the oldest—but by no means the first—concrete structures is the Castle Sant' Angelo at Rome. It was built in 138 A. D. as a tomb for Emperor Hadrian. A hundred years later it became a fortress, and since then has withstood every kind of armament from battering rams to cannon balls. It was never seized by the enemy, even during the Sack of Rome. More than 1500 years ago its costly marble veneer was broken or stripped away, leaving the massive concrete walls and foundations completely exposed. Fascist troops now use it as a barracks.

1844. Joe Goodrich, Wisconsin pioneer, brought portland cement by wagon from New York to build Milton House at the village of Milton, Wis. It has been a home, hotel and warehouse during the past 91 years. At present it is occupied by a printing plant.

1852. The Horace Greeley residence at Chappaqua, N.Y., was built as a barn on the Greeley estate. Its walls were

St. Augustine Cathedral, St. Augustine, Fla.—1874

Union Free School, Kingston, N. Y.—1867

Horace Greeley Residence, Chappaqua, N. Y.—1852

ld Timers

n Concrete Take It?"

made of what was then called "standard concrete." After Greeley's death the building was altered into a residence and is being used as such today by the famous editor's daughter, Mrs. Frank M. Clendenin.

1862. With funds, part of which were raised in Episcopal parishes of England, Trinity Chapel was built at Excelsior, Minn. Concrete was placed in wood forms made of 15 in. wide boards. When the building was jacked up and moved several blocks to its present location in 1907, there was no damage. A wing was added and services are now held in Trinity Chapel every Sunday.

1867. Union Free School was built for School District No. 13 of Kingston, N. Y. It has 12-in. concrete walls and 8-in. concrete partitions. Recent inspection revealed the building is in entirely satisfactory condition for school occupancy.

1870. The present Ponckhockie Congregational Church of Kingston, N. Y., was erected and called Union Chapel. It was built as a children's church and operated as such until 1910 when the present congregation was organized and took over the property.

1874. A new St. Augustine Cathedral was erected over the burned ruins of the original stone structure built in 1789. This concrete cathedral remains in good condition as do many similarly constructed buildings in St. Augustine.

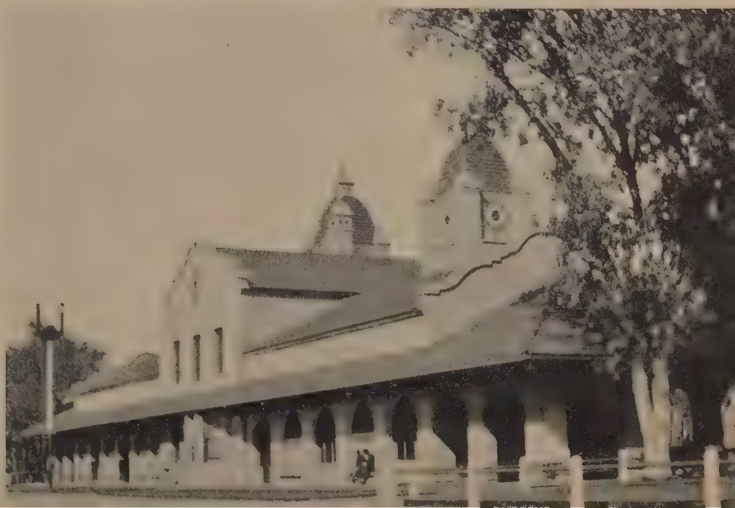
1900. The Northern Pacific Railway station was built at Bismarck, N. Dak., of monolithic concrete. The concrete was laid up in 10-in. courses, and the surfaces brushed to expose the white marble-chip aggregates. Picture shown here taken in 1934.

Milton House, Milton, Wis.—1844

Ponckhockie Congregational Church, Kingston, N. Y. —1870

Trinity Chapel, Excelsior, Minn.—1862

Northern Pacific Depot, Bismarck, N. D.—1900



File 10-7-1 Being Letters, Notes and Advices About ARCHITECTURAL CONCRETE

FILE 10-7-1 is getting fat. It started out hopefully as a thin little manila folder last September when ARCHITECTURAL CONCRETE was just a longing in the boss' bosom and a worried wrinkle on the editor's brow. It was to contain correspondence of a critical nature—the kind that makes either the ears burn or the face red—to be inspired, we hoped, by succeeding issues of this magazine.

With both joy and chagrin, therefore, we can announce that little 10-7-1 has outgrown one portfolio and is dangerously bulging another. With all but this page of Vol. 1 No. 3 ready for press, we will read over some of this file with you. You wrote it, and we hope you will continue.

• •

West to East

I found ARCHITECTURAL CONCRETE very interesting; and it is particularly interesting to note that you are making an effort to break down state lines and encourage this type of construction in Eastern States. I have been quite impressed by the beauty and unusual architectural treatment of the monolithic concrete buildings in Southern California and have often wondered whether there was any fundamental reason why the same type of construction could not be used in the East.

DONALD S. MORGAN,
The Lehman Corporation
New York City

There is no fundamental reason; no other reason. During 1934 there were more architectural concrete structures built east of the Rockies than in any previous year of history—this despite the lingering depression.

• •

Surprise

Without comment other than captions, N. Lester Troast, Juneau, Alaska, architect, sends pictures of renderings of three monolithic concrete buildings he has designed. One has been built; one is being built; the third is proposed —all for Juneau. This was exciting news to us, and we hope to have more news of these projects later, Mr. Troast.

Shattuck Building, Juneau, completed in 1934. The apartment building in rear was built in 1933. Both buildings, says Mr. Troast, are monolithic concrete.

Design for brewery at Juneau, Alaska, one of Mr. Troast's renderings of monolithic concrete buildings.

• •

Foreign Correspondence

We have studied first issue of ARCHITECTURAL CONCRETE with great interest . . . In this connection, we might mention that we are now constructing in Copenhagen an 8-story, monolithic concrete office building with outer walls cast in special forms so that the surface will need no special treatment after stripping.

CHRISTIANI & NIELSEN,
Architects and Engineers
Copenhagen, Denmark

To Christiani & Nielsen, architectural concrete is a familiar material as it is to many of their profession in all European countries.

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More References

In admiring the first issue of ARCHITECTURAL CONCRETE, I conceive that the usefulness of the articles would be enhanced if reference were made to current technical bibliography in which greater detail of design or construction could be found.

H. R. BEEBE, Incorporated
General Contractors
Utica, N. Y.

Not always is such information in published form. We are bending every effort, however, to make such information available as rapidly as possible.

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Pardon Please

In our second issue we noted John C. Austin, contributor of a fine article on Griffith Observatory, as A. I. A. Mr. Austin should have been designated, F. A. I. A.

• •

News Letters

Struck Construction Co., Louisville, Ky., has been awarded contract to build Georgia State Penitentiary at Reidsville, Ga. The seven buildings in this project, all monolithic concrete, were designed by Tucker & Howell, architects, and Robert Fiske, engineer, Atlanta.

• •

Hagan-Thibodeau Co., Woodsville, N. H., were low bidders at $46,015 for construction of a rigid frame concrete bridge and approaches over railroad at Winnisquam, Belknap County, N. H.

• •

Concrete protection for piles on the approach trestle to Army Base Docks at Charleston, S. C., has recently been completed by P. D. Hay. Mr. Hay has developed a method of pile encasement which seems to have important possibilities for prolonging the life of old timber piles in salt water. Work on Charleston docks under supervision of L. E. Sanford, Shipping Board engineer.

Alameda County Courthouse.

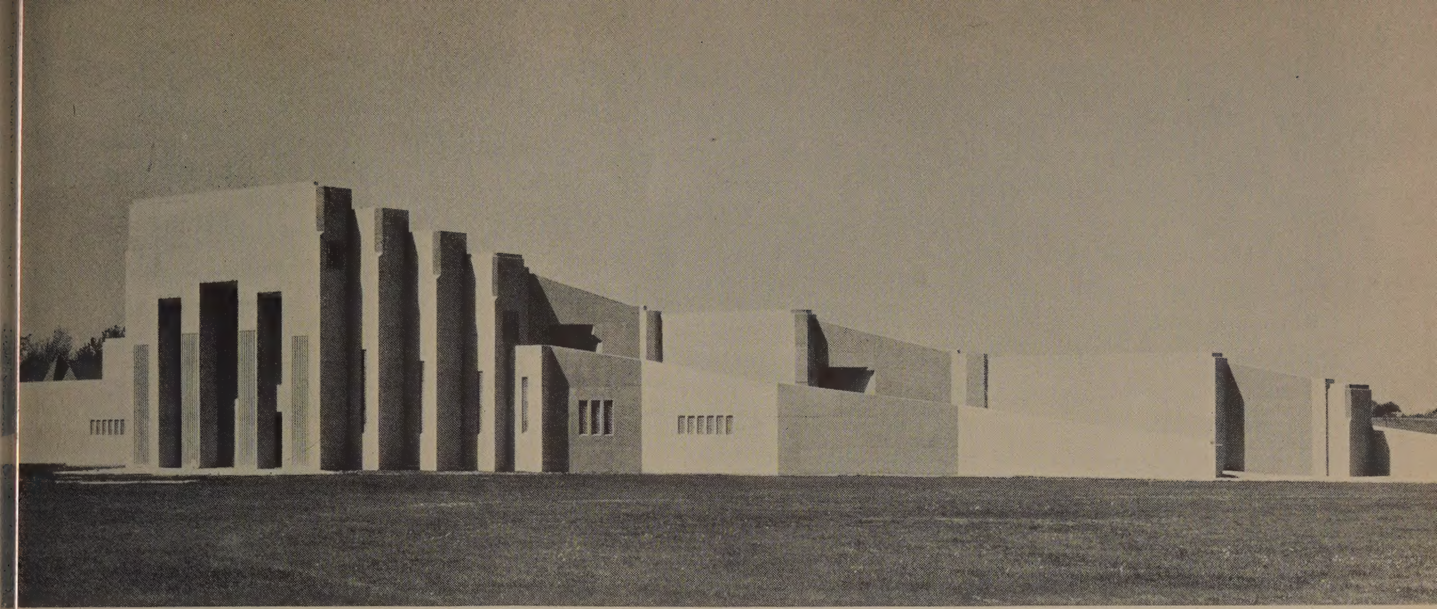
Contracts for construction of monolithic concrete Alameda County Courthouse, Oakland, Calif., have recently been awarded subject to PWA approval. General contract awarded to George Wagner and K. E. Parker Co., of San Francisco. Architects were W. G. Corlett, James E. Plachek, W. E. Stirmer, Carl Werner and H. A. Minton.

• •

Brennan & Sloan, New York contractors, recently put in floor fill and concrete floor finish in the new Rockefeller Center Building. Very low water-cement ratio concrete was placed with electric floating machines. An extremely fast work schedule called for one floor (40,000 sq. yd.) per day.

• •

Thus endeth the first sally into the vitals of File 10-7-1. We hope for many more and that the readers of ARCHITECTURAL CONCRETE will feel free to use 10-7-1 as the spirit moves them.



Beloit College Stadium, whose many intersecting planes make colors out of shadows. Its low sides and high center realize any ticket manager's dream—to seat 75 per cent of the football crowd within the 30-yard lines.

Beloit College Stadium

By A. P. FOX*

WALTER STRONG Memorial Stadium at Beloit, Wis., designed by Allen and Webster, Chicago architects, and completed for dedication and use during the 1934 football season, is an interesting departure from conventional stadium design. Illustrations show that in size and appearance it has little in common with the huge "bowls" and arenas which, during the past decade, have come to symbolize the popularity of America's autumn sport spectacle. Its style is vigorously modern, in no way suggesting the form and mass of what has been the common inspiration of most modern stadia—the Roman Colosseum. It is a small structure, built to seat 1,800 spectators.

The stadium was financed by Mrs. Walter Strong in memory of her late husband, the noted publisher and prominent Beloit alumnus. In his later years, Mr. Strong contemplated the gift of a stadium to his alma mater, but death came before he had completed arrangements for the donation. In carrying out his wish it was the desire of both Mrs. Strong and college officials that the stadium be a fitting memorial as well as a practical athletic plant.

Before plans were drawn it was decided that a single deck structure extending 300 ft. along one side of the playing field would be adequate for many years. It was also desirable that seating be arranged to accommodate 60 per cent of the spectators within the middle third of the length. Such a seating system required a structure much higher at the center than at the ends, an arrangement tending to develop a strong central axis. These requirements pointed logically to a modern design, and plans were projected accordingly.

When preliminary drawings were completed, the architectural design was studied by building a plaster model of the entire structure to scale. Even the smallest details were carved directly in the plaster. This model was then photographed from many angles and the perspective studied from every possible position. As a result of this study it was found advisable to change the proportions of the structure considerably. The model was accordingly refashioned and again studied until satisfactory lines and proportions were obtained. The model was also of great aid in working out the details of the intersection of the parapet walls at the back of the stadium. Since these details were very intricate, the true effect could not have been obtained from a flat drawing.

This method of design study, although frequently employed in planning large buildings, is not often used on small structures. The Beloit Stadium is a fine example of the value of studying modern architecture in three dimen-

*Regional Structural Engineer, Portland Cement Association, Chicago

sions. The degree of perfection achieved in the design is largely due to free manipulation of line, mass and detail in the plaster mold. It is strong, virile and full of life.

The stadium was built in five units separated by transverse expansion joints which extend entirely through the structure down to the footings. At the low side of the structure, where the short columns are very rigid, the expansion joints extend through the footings. The transverse frames supporting the deck were designed as rigid frames.

According to the architect, "reinforced concrete was selected for the construction of Beloit Stadium because as a plastic material it was entirely adaptable to the form and detail required by the plan, and because a permanent structure was desired at minimum cost." Concrete having an ultimate strength of 3,000 p. s. i. was used throughout. Design stresses of 1,000 p. s. i. in the concrete and 18,000 p. s. i. in the steel were used. Aggregates were carefully graded and the mixtures controlled so that at all times a uniformly dense and workable concrete was secured.

Exterior forms were made of ¾-in. plywood used in 4-ft. by 10-ft. panels. Construction joints were made exactly at the top edges of panels to assure no intermediate joints on the surface other than those between form panels. No effort was made to obscure joint lines since the large panels contributed to the effect of massiveness which was desired.

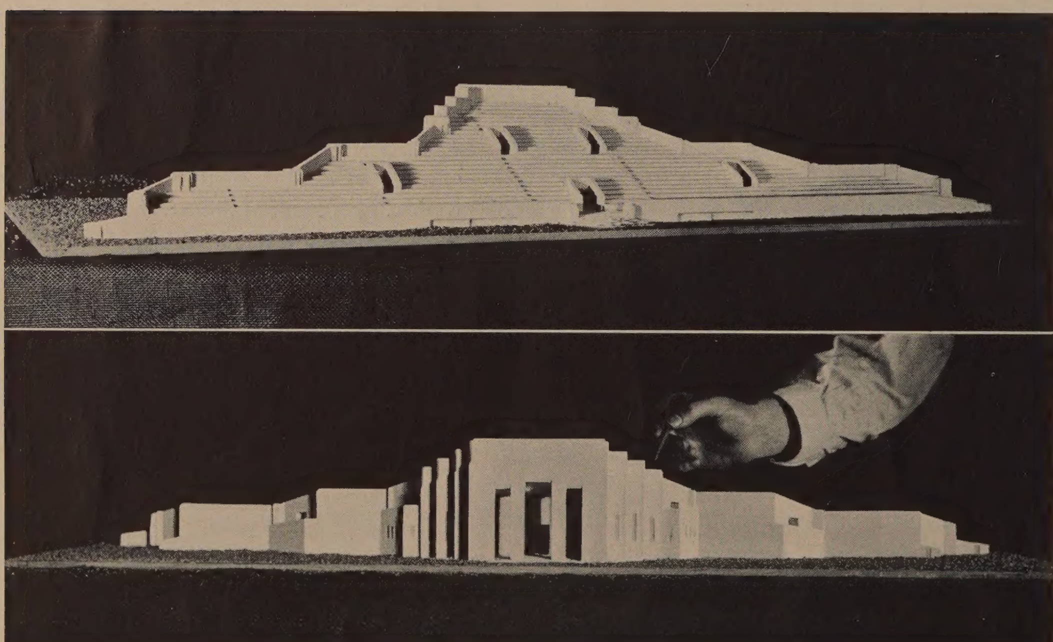
The plywood forms were used an average of eight times before replacement was necessary. When these forms were stripped the concrete surface was so smooth and even that no pointing, rubbing or other treatment was necessary. The structure looks now essentially as it did when forms were removed.

Two types of forms other than plywood were used for forming detail. The sculptured detail of the main entrance soffits, done by Boris Gilbertson of Chicago, was cast in plaster waste molds. The molds were set in a sand-bed supported by the form centering. They cost about 50 cents per square foot. Plaster waste molds were also used for the concrete hand-rails. The fluting on the piers of the main entrance was formed with stock wood molding.

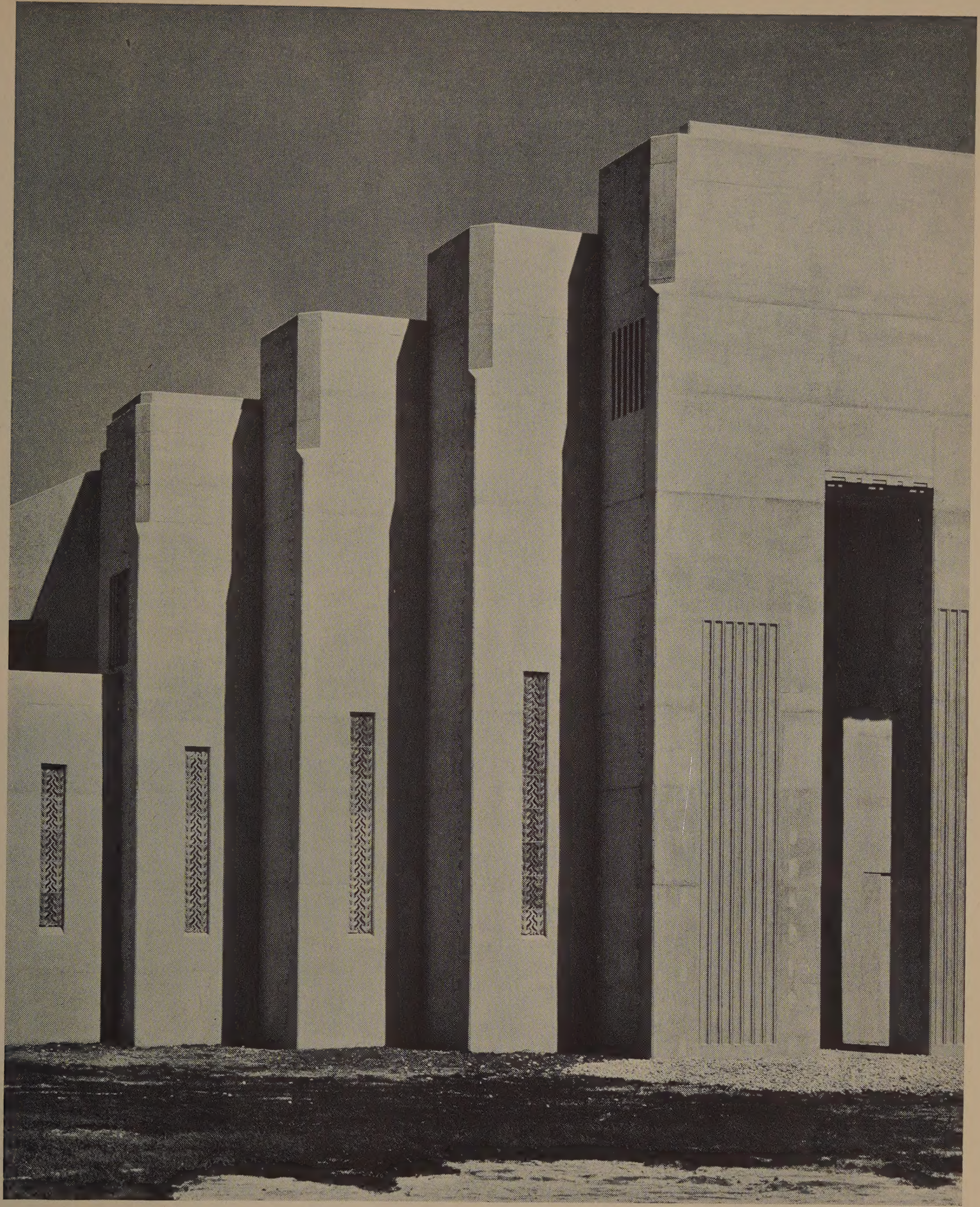
All windows are fixed and covered with aluminum grilles. At night, when flood lights are turned on behind the entrance columns and the grilles, the structure has a cathedral-like appearance.

The cost of the stadium—excluding equipment—was about $11 per seat. The equipment, including showers, lockers, and heating plant, cost $5 to $6 per seat.

Beauty and dignity, together with more than ordinary usefulness and durable construction, are the qualities that make Beloit Stadium an unique memorial and an efficient and practical grand-stand. At its dedication last fall it received the enthusiastic approval of students, alumni and college officials.



A plaster model, carved to scale and photographed from all angles, aided greatly in studying the architectural design.



The massive appearance of the walls and pilasters of Beloit Stadium is enhanced by the large panel plywood forms in which the concrete was placed. The fluting on the entrance columns was made with stock wood molding nailed in the forms. The enriched soffits were cast in place in plaster waste molds. All the grilles are aluminum. At night, when flood lights are turned on behind the grilles, the stadium takes on the appearance of a cathedral.

BELOIT COLLEGE STADIUM, Beloit, Wisconsin
Allen and Webster, Architects
Mogens Ipsen, Structural Engineer
Cunningham Bros., Contractors

A bridge like this calls for TWO orchids

Rigid frame concrete bridge on Six-Mile Road, Wayne County, Mich. Built by Wayne County Road Commission, H. A. Shuptrine, engineer.

When a bridge such as the one shown is completed, we can say . . .

To the Bridge Engineer - Congratulations on taking fullest advantage of rigid frame design. You used it to save headroom (deck is much shallower)—to reduce material quantities and fill. You achieved structural simplicity that further cut the first cost and will save maintenance and assure long life. And you have a bridge adaptable to future widening.

To the Bridge Architect - By wise use of the structural material—concrete—and the naturally graceful lines of the rigid frame, you have made an important contribution to bridge architecture. Truly a functional design—simple, modern, sincere. A bridge to be proud of.

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